Remarks

Claims 1-70, 81 and 82 remain in the application. None of the claims have been amended.

The third paragraph of the Summary of the Invention section of the specification has been amended to correct an editorial error, i.e. the a obviously should have preceded "hole" instead of following "hole". Applicants respectfully requests the Examiner to enter this editorial amendment to the specification because it does not add new matter and does not raise any new issues or require additional searching.

The last paragraph of the Details section of the specification has been amended to change "will" to "can" because the term "will" is inconsistent with the earlier description of the invention, namely the third and sixth paragraphs of the Summary of the Invention in the specification. The third paragraph contains the sentence:

The screen has hole a (amended to a hole) area above each of the cells and **the hole density and/or hole diameters in each of these hole areas are engineered to produce a substantially more uniform temperature and viscosity of molten glass exiting the tips**, or orifices, across the tip plate than produced by prior art bushings.

The following paragraph is the sixth paragraph of the Summary of the Invention in the specification. The highlighted combined with the portion of the specification above

provides descriptive support for the rejected claims and for the first screen having an engineered hole pattern areas.

The present invention also includes a bushing for making fibers from a molten material comprising at least one sidewall, a plurality of supports located above the a plate and below a screen and forming at least 12 cells between the screen and the tip plate through which molten glass flows to form the fibers, and **a first screen having engineered hole size and density areas above each internal cell**. The first screen is spaced above the tip plate, on the internal supports forming cells and is attached to at least one sidewall. **In this embodiment a second screen having holes therethrough is placed on top of said first screen with at least some of the holes in the second screen aligning with holes in the first screen, but the area of the holes per unit area of screen in the second screen is less than the area of holes per unit area of screen in the first screen**. This bushing is used in channel positions. The present invention also includes a method for making fibers using such a bushing.

The Examiner is urged to enter this amendment because it makes the claims allowable or will reduce the issues (35 USC 112, first paragraph) on appeal and because this amendment does not add any new matter or require any additional searching.

The invention of the present claims is a bushing for receiving a molten material and a bushing and method of using the bushing for fiberizing the molten material, such as molten glass, the bushing comprising a combination of one or two screens and a internal support structure comprising a plurality of internal supports welded to a top surface of a tip plate, the internal supports forming at least 24 cells between the screen and the tip plate. This large number of cells in combination with the differing hole areas

per screen area of the one or two screens above the cells permits a much more precise control of the flow of molten glass to the tip plate than does prior art bushings and therefore results in improved tip plate temperature profiles and improved fiber diameter uniformity and size. The bushing of claim 1 describes only one screen in the bushing, but claim 2 describes this busing having a second screen lying on top of the screen described in claim 1.

The bushings of the invention have at least two opposed sidewalls and at least two opposed end walls, a tip plate having at at least 1600 orifices with at least 1600 hollow tips, often 4000 or more tips, extending from a lower surface of the tip plate and arranged in double rows, the tip plate being attached to the sidewalls and end walls, the bushing having a boxlike shape having at least four interior corners, a screen having a low flow rate center portion and one or more high flow rate portions, the high flow rate portion(s) being adjacent to the center portion and one or more walls of the bushing, the bushing also having an interior support structure comprising a plurality of internal supports welded to a top surface of the tip plate for supporting the tip plate, at least some of the internal supports being attached to one or more of the end walls and at least some of the internal supports being attached to one or more of the sidewalls, and the bushing also having linear external supports contacting the bottom of the tip plate, the support structure forming at least 24 cells located between the bottom of a screen resting on, or mounted very near the top of, the top of the interior support structure. The interior support structure comprises a plurality of intersecting or crossing internal supports with angles between the intersecting supports at each intersection, the internal support structure, in cooperation with the at least one sidewall and the at least one end wall. The screen, or at least one screen, has a plurality of screen areas containing holes through the screen with a screen area above each of the at least 24 cells formed by the internal support structure adjusted such that the hole area per unit screen area in the high flow

rate portions(s) of the screen is greater than the hole area per unit screen area in the low flow rate center portion of the screen,. Key features of the invention include the screen having a low flow rate center portion with a higher flow rate portion, or portions, adjacent the center portion, the presence of a relatively large number of separate cells beneath the screen and locating the screen of the invention in the bushing such that the bottom of the screen is resting on the top of the support structure, or mounted so close to the top of the support structure that the distance therebetween is less that that at which lateral flow of molten glass from one cell to one or more adjacent cells becomes significant to maintaining optimization of tip plate temperature profile, or is resting on the top of a second, conventional screen that is resting on the top of the support structure. In other embodiments of the invention a second screen lies on top of a first screen, the hole size and density in the second screen being such that the hole area of the second screen is less than the hole area of the first screen. These embodiments permit changing production of smaller diameter fibers with the same bushing by simply inserting the second screen into the bushing to lay on top of the first screen without having to rebuild the bushing. or in some cases even to remove the bushing. The bushings of the invention advance the art by providing much better control and uniformity of temperature of the molten glass at the tip plate using these key features than had heretofore been possible using the bushings and teachings of the prior art which did not reflect any concern for lateral flow of molten glass beneath the screen.

Claims 2, 4, 6, 9, 12, 14, 16, 19, 22, 32, 34, 39, 42, 49, 52, 62, 81 and 82 stand rejected under 35USC112, first paragraph, as failing to comply with the written description requirement, the Examiner urging that the specification does not contain basis for "a second screen lying on top of a first screen that is also an inventive screen." The screen in claim 1, the first screen, is a screen having a hole area in some areas of the screen that differs from the hole areas in other areas of the screen, and the second

screen can be similar, but differs in that the hole area per unit area of the second screen is less than the hole area per unit area of the first screen. There is ample basis for this in the specification where some reasons for doing this include converting a bushing designed to operate in a non-channel position to a bushing suitable for a channel position, page 6, lines 11 – 30, and converting a bushing designed to make larger diameter fibers to a bushing designed to make smaller diameter fibers, see page 18, lines 8-21.

The following is taken from the third paragraph of the Summary of the Invention in the specification.

The screen has hole a (amended to a hole) area above each of the cells and the hole density and/or hole diameters in each of these hole areas are engineered to produce a substantially more uniform temperature and viscosity of molten glass exiting the tips, or orifices, across the tip plate than produced by prior art bushings.

The following paragraph is the sixth paragraph of the Summary of the Invention in the specification. The highlighted combined with the portion of the specification above provides descriptive support for the rejected claims.

The present invention also includes a bushing for making fibers from a molten material comprising at least one sidewall, a plurality of supports located above the a plate and below a screen and forming at least 12 cells between the screen and the tip plate through which molten glass flows to form the fibers, and **a first screen having engineered hole size and density areas above each internal cell**. The first screen is

spaced above the tip plate, on the internal supports forming cells and is attached to at least one sidewall. **In this embodiment a second screen having holes therethrough is placed on top of said first screen with at least some of the holes in the second screen aligning with holes in the first screen, but the area of the holes per unit area of screen in the second screen is less than the area of holes per unit area of screen in the first screen**. This bushing is used in channel positions. The present invention also includes a method for making fibers using such a bushing.

The following paragraph is taken from page 28 of the specification. The highlighted areas support applicants' arguments that the specification does support the rejected claims in accordance with 35 USC 112, first paragraph. These other uses, or bushing designs, can be different than bushings designed for channel positions, particularly when used in non-channel positions, which the specification supports as pointed out above.

The present invention has other uses to give a standard design bushing that is already built, or even in place making fiber, greater capability or better efficiency. Two of these applications include allowing a bushing designed to make coarse fiber to also make fine fiber without rebuilding and allowing a bushing designed to run one kind of glass also run another kind of glass having a completely different fiberizing temperature and temperature-viscosity curve.

The Examiner apparently bases the rejection on the fact that in some places the applicants use the term conventional screen. Actually the screens used in the invention can be any conventional screen, engineered screens or screens having uniform hole

diameters and densities, so long as they satisfy the other limitations of the screen in the claims. Note that the invention lies in the **combination** of various **engineered** screen designs, i. e. screens having differing hole areas in different areas of the screen **with the internal support structure described in the claims and producing at least 24 cells** between a screen in the bushing and the tip plate.

For these reasons applicants believe that the claims satisfy the requirements of 35 USC 112, first paragraph and therefore respectfully requests the Examiner to withdraw this rejection and to allow all of the claims.

Claims 1, 3, 5, 7, 8, 10, 11, 13, 15, 17-18, 20, 31, 33, 35, 37-38, 40-41, 43-45, 47-48, 50, 61, 63-65, 67-68 and 70 stand rejected under 35 USC 103 as being unpatentable over Marra '027 in view of Hanna et al and Harris. The Examiner urges that Marra teaches a screen (pressure control plate 30) having different hole area per unit area in some portions than in other portions and other elements of the claimed bushings or methods, but does not teach the number of tips, or a bushing having at least 24 cells formed between the screen and the tip plate, or an internal support structure whose elements intersect and form angles with one another. However, the Examiner states that Hanna teaches bushings having these missing features and that it would have been obvious in the sense of 35 USC 103 to have combined the teachings of Marra and Hanna et al to obtain the claimed invention. This invention is traversed for the following reasons:

1) Combining the teachings of Marra with the teachings of Hanna et al does not produce the claimed invention, but rather leads one of ordinary skill away from the claimed invention. The teachings of Marra lead the skilled artisan to a bushing in which the end portions 24 of the pressure control plate 30 have a lower flow rate than than the center portion 15, see the paragraph spanning columns 3 and 4, Figure 4 and col. 4, lines 16-

26. Also note, lines 30-34 of col. 4 where Marra states that the pressure control plate above chamber 28, the center portion of the pressure control plate 30 can be dispensed with. This and the teachings in Marra and in U.S. Pat. No. 4,488,891 incorporated into Marra to describe the parameters of a "dripless bushing" clearly show that Marra teaches a pressure control plate, screen, that is completely different in kind and result than the screen in the claimed invention.

2) Marra teaches the solution of a different problem with a different solution to obtain a different result (bushing/method) than the claimed invention. This is discussed in the present specification on page 3, lines 5-17. As shown in Marra in col. 1, lines 39-51 and 54-68 and in col. 2, lines 1-4, the problem dealt with by Marra are one or more of the disadvantages of the dripless bushing of 4,488,891, and the solution of Marra is to change the bushing to a hybrid bushing containing dripless sections and a non-dripless section with the dripless sections being at the ends of the bushing, and by doing so by varying the flow rate through the pressure control plate 30 such that the flow rate of molten glass into the dripless sections 40 is lower than the flow rate of molten glass into the non-dripless center portion 38. Also, Marra's objective is not to achieve a more uniform tip plate temperature, that will solve or greatly reduce the problem of fibers breaking out, especially in the corner portions and end portions of the tip plate, but instead Marra's solution is to prevent the breakouts that do occur in the end portions tip plate from breaking out the fiber array from the rest of the bushing and by doing so by preventing the tips having broken fibers in the dripless sections from "beading down", from forming beads heavy enough to break away from the tips which would cause a breakout of the entire bushing, see col. 1, lines 30-39 and lines 27-29, and also col. 1, lines 47-58 of 4,488,891 that describes how a bead drop can cause the array of fibers coming from a bushing to totally break out, causing costly interruption of the bushing fiberization. The result of the teachings of Marra is a bushing having a pressure control

plate whose end portions have a lower flow rate, i.e. smaller hole area per screen unit area than the center portion. This is opposite of the claimed bushings. This is **opposite of the claimed inventioin, teaching away from the claimed invention!** . A reference that teaches addressing a different problem, the slow bead down time of a dripless bushing, with a completely different solution, adapting or slightly reducing the problem instead of solving or greatly reducing the problem, and getting a completely different result could not possibly have lead the skilled artisan to the claimed invention.

3) Nothing in Hanna et al or Harris would lead the skilled artisan to reverse the teachings of Marra, **because to do as the Examiner urges would make Mara inoperative according to his invention, see col. 1, lines 65 through col. 2, lines 1-4**. There would be no reasonable motivation to modify Mara to make the bushing inoperative according to Mara's invention.

4) The Examiner urges that it would have been obvious in the sense of 35 USC 103 to have used the internal support structure of Hanna et al in the Mara bushing. That is debatable, but even if one assumes it would have been, **doing so would not produce the claimed invention** for the reasons described above, i.e. the necessity of making the molten glass flow through the pressure plate 30 near the ends of the bushing **less per unit area** than the molten glass flow rate in the center portion of the pressure plate..

5) The Examiner urges that Harris teaches a bushing screen having a plurality of screen areas with the hole area per unit area of screen area being different in some areas than in other screen. While this is true, Harris nevertheless leads away from the claimed invention and here is why:

5c) Harris teaches bushings having up to 800 tips receiving solid glass marbles or other solid shapes and for melting the solid glass shapes in a melting chamber 22 in the bushing and on a baffle 24. The baffle 24 has different sized holes therethrough for the purpose of improving the temperature uniformity of the tip plate. When melting glass inside the bushing, the temperature of the molten glass varies substantially more than the molten glass coming into the bushing from a bushing leg of a melting furnace. In the Harris bushing, the bottom of the baffle 24 is located a substantial distance from the top of the tip plate 15. There is no mention or suggestion in Harris of lateral or partially lateral flow of molten glass between the baffle and the tip plate, or how to prevent such flow to achieve the maximum effect of the baffle defined by Harris. Since Hanna et al teaches at col. 8, lines 45-49, that the invention makes bushings having 1600 or more orifices perform in a substantially superior manner, it is unlikely that one of ordinary skill in the art would find it obvious to apply the very expensive support structure of Hanna et al to the 800 tip bushings taught by Harris. The support structure of Hanna et al is made from alloys of platinum and rhodium, preferably 80% Pt and 20% Rh. The prices/cost of Pt and Rh vary somewhat from time to time, but are always very expensive. For example, the current price of Pt is $1,186 per troy ounce and the cost of Rh about $9,000 per troy ounce. Tip plate sag is not a substantial problem in a 600-800 tip bushing and would not justify so costly an internal support structure.

5b) The bushing of Harris does not receive molten material, but rather receives unmelted, solid pieces of glass such as marbles, see col. 2, lines 67-70, and melts the solid glass while the solid pieces of glass lay on the baffle 24. As the glass melts and reaches a sufficiently low viscosity the molten glass flows through the holes in the basket 24 and down into the space above the tip plate 15. Harris teaches that the ends of this bushing tend to be of substantially higher temperature than intermediate portions, see

col. 3, lines 21-24 and lines 34-38. One of ordinary skill in the art would recognize that most or all of this situation is the result of the solid glass being introduced through only two inlets 16 that are spaced away from the ends of the bushing and that the cold, solid glass therefore cools off the center portion of the bushing to a much greater extent than the ends. Thus, one of ordinary skill in the art would not look to Harris to improve a much larger bushing like those of Mara or Hanna et al that receives molten glass material already at or near fiberizing temperatures and also because Harris teaches in col. 3, lines 47-59, a higher open area per unit of screen at the end regions of the baffle 24 than the open area per unit of screen area in the center region of the baffle because the ends of the bushing tend to be hotter than the center portion, thus would clearly lead one skilled in the art away from the claimed invention, i.e. Harris teaches using larger holes in the screen in areas that are at the highest temperature, see col. 3, lines 47-59 while the claimed invention does the **opposite**. Thus, **the teachings of Harris leads a skilled artisan away from the claimed invention**.

5c) Harris suggests that it is not necessary to consider later flow of the molten glass between the baffle and the tip plate to achieve a good temperature and flow rate uniformity through the tips whereas applicants teach that this is an important factor to achieving superior results. Because of the high cost of precious metal coupled with the teachings of Harris, also lead the skilled artisan away from using the screen of Harris and the internal support structure of Hanna et al in the bushing of Mara.

For these reasons Applicants believe the present claims are patentable under 35 USC 103 over Marra in view of Hanna et al and Harris, and respectfully requests the Examiner to withdraw this rejection and to allow all of the claims.

Claims 1-2, 21, 31-32, 51 and 61-62 stand rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 1 and 3-4, 7 and 34-37 of 7,194,875 and in view of Marra and Hanna et al. This rejection is traversed for the reasons given above in response to the rejection under 35USC103, Applicants do not believe that the claimed invention is made obvious by the teachings of Marra and Hanna et al. The teachings of Marra are so contrary to the problem addressed, a more uniform tip temperature, and the solution, a higher flow rate through the end portions of the screen than the center portion, that the teachings of Marra would not lead the skilled artisan to combine the teachings of 7,194,875 with Hanna et al to obtain the claimed invention – note that 7,194,875 does not teach placing the screen on or very close to the internal supports of the tip plate, and Marra teaches isolating sections 40 only to achieve a low flow rate, dripless operation in the end portions of the bushing compared to the center portion of the bushing, an opposite result of the invention claimed here. Thus one of ordinary skill in the bushing art would not be led to the claimed invention by Marra. Note that neither 7,194,875 nor Hanna et al teach supporting the screen in the manner of the claimed invention and that Marra states that the partitions (apparently 36) extend from the discharge wall (tip plate) to the pressure control plate 30 and does not say that they are welded or otherwise attached to either, i.e. Marra does not teach or reasonably suggest that the partitions are internal supports for the tip plate.

Applicants further contend that this rejection is an improper hindsight rejection using applicants present specification as a "road map" or "template" to find references the Examiner believes teaches the various parts of the claimed invention and then unreasonably and improperly combining those references according to the teachings of those references to obtain the invention even though one or ordinary skill in the art would not arrive at the claimed invention from the reasonable teachings of those references. For these reasons applicants believe that the claimed invention is not properly subject to